

Traffic And Revenues

ASTORIA BRIDGE

Wilbur Smith and Associates

HIST

388.132

TRAFFIC

1967

Facilities.

- Columbia River Bridge

Astoria-Megler

March 1967

Traffic and Revenues

ASTORIA BRIDGE

Oregon

Prepared for

Oregon State Highway Department

By

Wilbur Smith and Associates
New Haven, Connecticut

March, 1967

Wilbur Smith and Associates

Cable: WILSMITH

CONSULTING ENGINEERS

155 WHITNEY AVENUE

New Haven, Conn. 06510

March 27, 1967

Mr. Forest Cooper
State Highway Engineer
State Highway Building
Salem, Oregon

Dear Mr. Cooper:

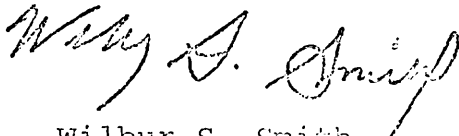
We are pleased to submit this traffic and revenue report for the Astoria Bridge.

The report presents the various studies and analyses made in developing an optimum toll schedule and annual traffic and revenue estimates for the facility. The findings and recommendations are based upon extensive field investigations which include origin and destination surveys, route reconnaissance studies and an evaluation of current and projected development in the travel corridor of the Astoria Bridge.

Assuming the recommended toll schedule is implemented on August 1, 1967, we estimate toll revenues of \$800,000 for the Astoria Bridge in 1967. This is estimated to increase to \$1,431,000 in 1981.

We have enjoyed working with you in this very interesting and important project and would like to extend our appreciation to you, members of your staff and the numerous agencies and individuals contacted during the course of our studies for the excellent cooperation given to us.

Respectfully submitted,



Wilbur S. Smith

Reg. Prof. Eng.
State of Oregon No. 4647

WSS/ame

TABLE OF CONTENTS

<u>CHAPTER</u>		<u>PAGE</u>
1	INTRODUCTION	1
	Authority, Purpose and Scope of Study	1
	Description of Bridge	2
2	AREA GROWTH ANALYSIS	4
	Population Trends	4
	Trends in Retail Sales	6
	Average Effective Buying Income Per	
	Family Trends	6
	Trends in Motor Vehicle Registrations	9
	Motor Fuel Consumption Trends	11
	Employment and Payroll Growth Trends-	
	Clatsop County, Oregon	12
	Future Growth	13
3	TRAFFIC STUDIES	16
	Present Highway System	16
	Annual Traffic Trends	17
	Monthly Traffic Variations	20
	Origin and Destination Studies	23
	Vehicle Classification Counts	24
	Estimated 1966 Annual Average Daily	
	Traffic	26
	Present Travel Patterns	26
	Trip Purpose Distribution	27
	Trip Frequency Distribution	28
	Typical Time-Distance Relationships	29
4	ESTIMATED TRAFFIC AND REVENUES	32
	Basic Assumption	32
	Recommended Toll Schedule	33
	Estimated Growth in Bridge Usage	36
	Estimated 1968 Traffic and Revenues	37
	Estimated Annual Traffic and Revenues	39

ILLUSTRATIONS

<u>FIGURE NO.</u>		<u>FOLLOWING PAGE</u>
1	Location Map	1
2	Traffic Flow Map-1965	16
3	Travel Desires-Astoria Bridge-1966	26
4	Travel Desires-Longview Bridge-1966	27

TABULATIONS

<u>TABLE NO.</u>		<u>PAGE</u>
1	Population Trends	5
2	Trends in Retail Sales	7
3	Average Effective Buying Income Per Family Trends	8
4	Motor Vehicle Registration Trends	10
5	Motor Fuel Consumption Trends	11
6	Employment and Payroll Growth Trends - Clatsop County, Oregon	12
7	Annual Traffic Trends - Selected Highway Locations	18
8	Annual Traffic Trends-Vancouver-Portland Interstate Bridge-Longview Bridge- Megler Ferry	19
9	Monthly Traffic Variations - Selected Highway Locations	21
10	Monthly Traffic Variations-Vancouver- Portland Interstate Bridge-Longview Bridge-Megler Ferry	22
11	Monthly Traffic Trends-Astoria Bridge	23
12	Location and Operation of Survey Stations	24
13	Vehicle Classification Counts	25
14	Trips Purpose Distribution	29
15	Trips Frequency Distribution	30
16	Typical Time-Distance Relationships	31
17	Present Toll Schedule	34
18	Recommended Toll Schedule	35
19	Estimated Annual Per Cent	38
20	Estimated 68 Traffic and Revenues	40
21	Estimated Annual Traffic and Revenues	41

Chapter 1

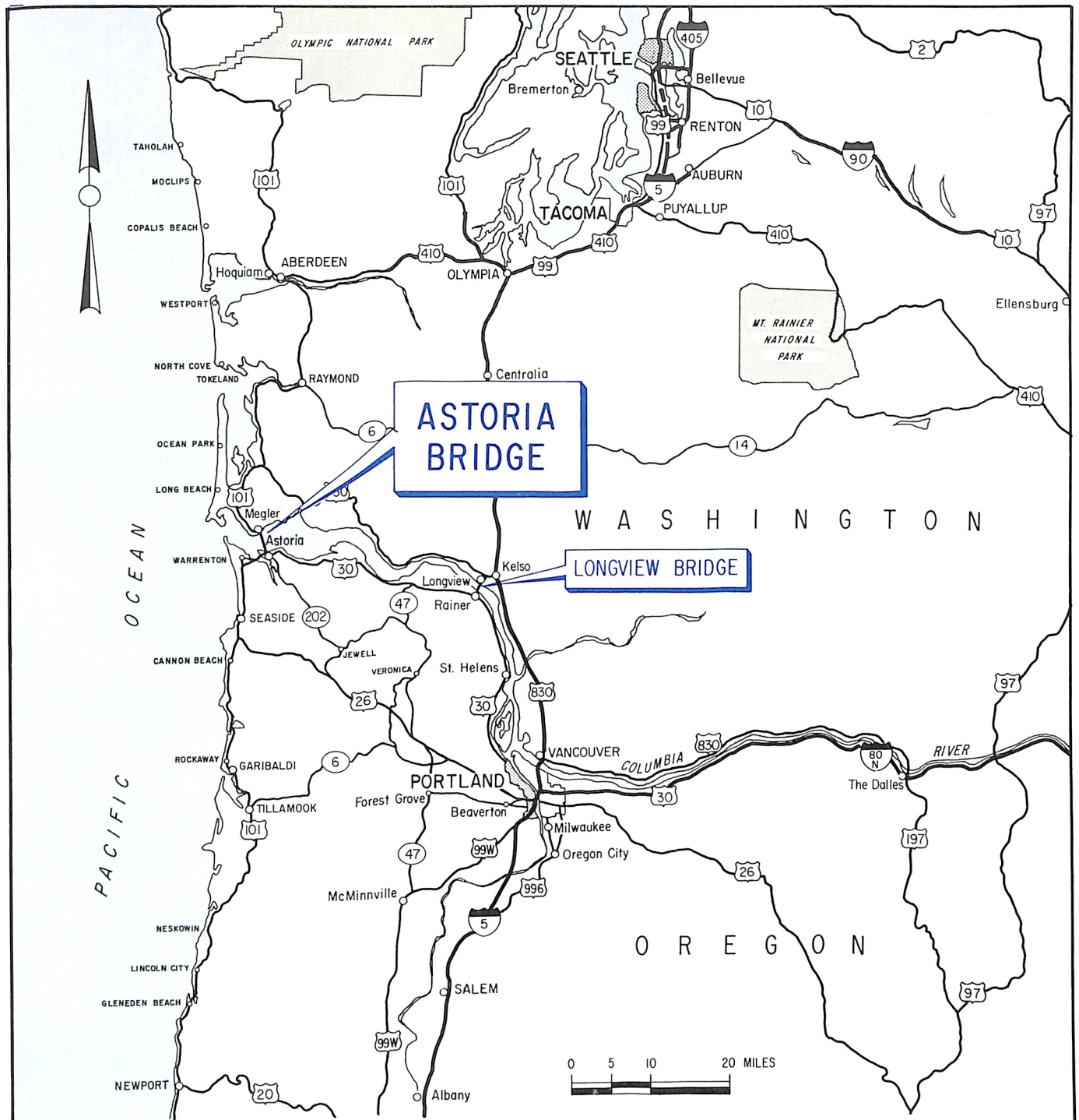
INTRODUCTION

The Astoria Bridge was opened to motorists on August 1, 1966. The new toll facility spans the Columbia River between Astoria, Oregon and Point Ellice, near Megler, Washington.

As shown in Figure 1, the bridge is served by U.S. Route 101 to and from the north and south. This highway parallels the Pacific coastline passing through California, Oregon, and Washington from the Mexican border to Juan De Fuca Strait, dividing the United States and Vancouver Island in Canada. The primary east-west connecting routes are U.S. Route 830 on the north side of the Columbia River in Washington and U.S. Route 30 on the south side of the river in Oregon. Further east, both of these highways connect with Interstate Route 5 which serves the Olympia, Tacoma, and Seattle areas in Washington and Portland, Salem and Eugene in Oregon.

Authority, Purpose and Scope of Study

On September 8, 1966, the Oregon State Highway Commission authorized a traffic and revenue study for the Astoria Bridge. The purpose of the study was to develop an optimum toll schedule for the Astoria Bridge and to project traffic and revenues annually for a 30-year period assuming implementation of the recommended schedule.



LOCATION MAP

A general economic evaluation of the study area was made to determine present levels of economic activity and to aid in projecting future bridge growth. Trends in population, retail sales, average effective buying income, motor vehicle registrations, and motor fuel consumption were obtained and analyzed. Consideration was also given to existing and projected growths in recreational facilities and commercial activities in the area of the Astoria Bridge.

Origin and destination roadside interviews were conducted over a period of several days on the Astoria Bridge and the Longview Bridge. Vehicle classification and volume counts were made concurrently with the interview studies. Route reconnaissance investigations were made on all pertinent highways in the Astoria-Longview Bridges area. Annual, monthly, and daily traffic variations were assembled and analyzed.

Using present bridge travel patterns, traffic movements via the Astoria and Longview Bridges were reassigned to the two facilities based upon various toll rates. A toll schedule which would produce a high level of toll revenues while still providing good traffic service was recommended. Annual traffic and revenues were then projected for the next 30 years.

Description of Bridge

The Astoria Bridge is 4.1 miles long with two 14-foot travel lanes. The bridge spans two navigational channels. The major channel, on the south side of the river, is provided bridge vertical and horizontal clearances of 198 and 1,070 feet, respectively at mean high water. Vertical and horizontal clearances for the north channel are 64 and 335 feet, respectively, at mean high water.

Tolls for use of the bridge vary from \$1.00 for a motorcycle or bicycle to \$7.50 for an eight axle vehicle. Passenger cars are assessed \$1.50 and two axle trucks and buses-\$3.00. Larger vehicles pay the \$3.00 rate plus \$0.75 for each additional axle. No reduced fare or volume discount programs are presently available.

Chapter 2

AREA GROWTH ANALYSIS

For purposes of economic and growth analysis, a study corridor was delineated covering the area which would be most directly served and influenced by the bridge. The corridor is generally defined as including the counties from Portland, Oregon to the south, to Olympia, Washington on the north and Interstate Route 5 to the east and the Pacific Ocean on the west. The Oregon Counties were Clatsop, Columbia, Multnomah, Tillamook, and Washington and those in Washington State--Clark, Cowlitz, Gray's Harbor, Lewis, Pacific, Thurston, and Wahkiakum.

Population Trends

Between 1950 and 1960, the population of the 12-county study area increased 1.0 per cent per year. During this same period, Oregon and Washington recorded growths of 1.5 and 1.8 per cent per year, respectively; the national growth was 1.7 per cent.

As shown in Table 1, an average annual increase in population of 1.2 per cent occurred in the study area between 1960 and 1965. Washington County in Oregon realized the highest growth--4.1 per cent per year. Clatsop County experienced a population decrease of 1.9 per cent per year and Pacific County, a decrease of 1.1 per cent annually. Within the study area,

Table 1
POPULATION TRENDS

AREA	1950	AVERAGE ANNUAL PER CENT CHANGE	1960	AVERAGE ANNUAL PER CENT CHANGE	1965
<u>Cities:</u>					
Aberdeen, Wash.	19,653	-0.5	18,741	0.6	19,300
Astoria, Ore.	12,331	-0.9	11,239		N.A.
Longview, Wash.	20,339	1.4	23,349	2.2	26,000
Olympia, Wash.	15,819	1.9	17,400	2.8	20,000
Portland, Ore.	373,628	-0.1	372,676	0.5	382,900
Vancouver, Wash.	41,664	-2.8	31,700	-0.4	31,100
<u>Counties:</u>					
Oregon -					
Clatsop	30,776	-1.2	27,380	-1.9	24,900
Columbia	22,967	-0.3	22,379	0.4	22,800
Multnomah	471,537	1.0	522,813	1.0	549,000
Tillamook	18,606	0.2	18,955	-2.3	16,900
Washington	61,269	4.2	92,237	4.1	112,800
Washington -					
Clark	85,307	1.1	94,500	1.8	103,200
Cowlitz	53,369	0.8	57,801	1.1	61,200
Gray's Harbor	53,644	0.2	54,465	1.0	57,100
Lewis	43,755	-0.4	41,858	0.5	43,000
Pacific	16,558	-1.2	14,674	-1.1	13,900
Thurston	44,884	2.2	55,700	2.0	61,600
Wahkiakum	3,835	-1.1	3,426	-0.1	3,400
12-County Study Area	906,507	1.0	1,006,188	1.2	1,069,800
<u>States:</u>					
Oregon	1,521,341	1.5	1,768,687	1.7	1,921,500
Washington	2,378,963	1.8	2,853,214	1.4	3,067,200
United States ⁽¹⁾	150,697,361	1.7	178,464,236	1.7	194,206,000

(1) Does not include Alaska and Hawaii.
N.A. = Not Available

SOURCE: U.S. Department of Commerce, Bureau of Census; Sales Management, "1965 Survey of Buying Power."

Olympia and Longview recorded the highest population growths between 1960 and 1965. Statewide population increases of 1.7 and 1.4 per cent annually occurred in Oregon and Washington, respectively. The national growth rate was 1.7 per year.

Trends in Retail Sales

Retail sales in the 12-county study area increased an average of 2.3 per cent per year between 1955 and 1960. As shown in Table 2, this growth rate more than doubled during the next five years to 5.1 per cent.

Washington County was the fastest growing area, between 1960 and 1965, with an average annual growth of 13.9 per cent; Longview led the municipalities studied with an increase of 10.3 per cent per year. The study area growth rate of 5.1 per cent per year was equal to the national average, higher than the 3.4 per cent realized in Washington and lower than the 5.6 per cent recorded in Oregon.

Average Effective Buying Income Per Family Trends

The 12 county study area recorded an average annual increase of 3.9 per cent in average effective buying income per family between 1955 to 1960. As shown in Table 3, this was below the growth rate realized in Oregon-4.7 per cent and the national average annual increase-4.2 per cent, but exceeded the 2.8 per cent average annual growth recorded in Washington.

During the period 1960-1965, the 12-county study area experienced an average annual growth of 2.7 per cent. This compared with growths of 4.4 per cent in Oregon, 3.6 per cent in Washington and 3.5 per cent for the nation. Washington County led all other study area counties in growth of effective buying income with an increase of 7.8 per cent per year.

Table 2

TRENDS IN RETAIL SALES

AREA	1955	AVERAGE	1960	AVERAGE	1965
		ANNUAL		ANNUAL	
		PER CENT		PER CENT	
CHANGE					
(thousands of dollars)					
<u>Cities:</u>					
Aberdeen, Wash.	\$ 41,319	1.1	\$ 43,578	4.5	\$ 54,378
Astoria, Ore.	21,663	-1.9	19,700	--	N.A.
Longview, Wash.	39,350	1.1	41,586	10.3	67,994
Olympia, Wash.	47,584	0.5	48,770	7.6	70,348
Portland, Ore.	731,365	1.4	784,534	1.4	842,924
Vancouver, Wash..	52,841	3.2	61,808	3.1	72,033
<u>Counties:</u>					
Oregon -					
Clatsop	\$ 32,961	0.3	\$ 33,457	5.0	\$ 42,730
Columbia	17,704	2.1	19,667	3.2	23,072
Multnomah	784,383	2.1	868,337	3.7	1,039,558
Tillamook	20,969	-0.5	20,470	0.8	21,265
Washington	64,228	7.5	92,386	13.9	177,516
Washington -					
Clark	79,199	3.9	95,729	5.2	123,253
Cowlitz	60,930	1.5	65,710	7.1	92,500
Gray's Harbor	67,360	1.8	73,608	4.1	89,815
Lewis	53,500	0.6	55,184	7.3	78,721
Pacific	14,564	-0.1	14,479	6.6	19,945
Thurston	58,093	2.1	64,525	6.8	89,692
Wahkiakum	1,871	2.8	2,144	4.0	2,614
12-County Study Area	\$ 1,255,762	2.3	\$ 1,405,696	5.1	\$ 1,800,681
<u>States:</u>					
Oregon	\$ 2,056,951	2.7	\$ 2,354,783	5.6	\$ 3,091,064
Washington	3,131,817	3.7	3,752,243	3.4	4,443,387
United States ⁽¹⁾	185,543,993	3.4	218,970,170	5.1	280,544,590

(1) Does not include Alaska and Hawaii.

SOURCE: Sales Management, "Survey of Buying Power."

Table 3

AVERAGE EFFECTIVE BUYING INCOME PER FAMILY TRENDS

AREA	1955	AVERAGE ANNUAL PER CENT CHANGE	1960	AVERAGE ANNUAL PER CENT CHANGE	1965
<u>Cities:</u>					
Aberdeen, Wash.	\$ 5,797	2.4	\$ 6,525	2.9	\$ 7,547
Astoria, Ore.	5,289	4.0	6,446	--	N.A.
Longview, Wash.	6,349	2.3	7,112	1.3	7,596
Olympia, Wash.	6,393	1.8	7,005	1.0	7,350
Portland, Ore.	5,240	3.9	6,334	4.8	8,014
Vancouver, Wash.	5,262	2.2	6,137	3.6	7,335
<u>Counties:</u>					
Oregon -					
Clatsop	\$ 4,930	5.0	\$ 6,283	0.7	\$ 6,519
Columbia	4,021	5.7	5,302	1.4	5,686
Multnomah	5,057	4.2	6,224	5.1	8,002
Tillamook	4,531	5.5	5,934	2.5	6,723
Washington	4,654	5.2	6,007	7.8	8,756
Washington -					
Clark	4,821	3.2	5,639	4.3	6,971
Cowlitz	5,563	2.9	6,423	0.9	6,702
Gray's Harbor	5,234	2.7	5,969	3.2	7,006
Lewis	4,341	3.1	5,057	3.9	6,123
Pacific	4,403	3.7	5,296	0.8	5,506
Thurston	5,147	2.7	5,887	2.8	6,746
Wahkiakum	5,359	3.6	6,403	-2.7	5,601
12-County Study Area Avg.	\$4,838	3.9	\$5,869	2.7	\$6,695
<u>States:</u>					
Oregon	\$ 4,760	4.7	\$ 6,001	4.4	\$ 7,436
Washington	5,579	2.8	6,403	3.6	7,643
United States ⁽¹⁾	5,465	4.2	6,723	3.5	7,989

(1) Does not include Alaska and Hawaii.

SOURCE: Sales Management, "Survey of Buying Power."

In 1965, the average effective buying income per family in the study area was \$6,695; this was below the Oregon, Washington and national averages. Within the study areas, Portland recorded the highest income level-\$8,014 followed by Longview and Aberdeen, \$7,596 and \$7,547, respectively. Washington County, with \$8,756, had the highest average income level among the study area counties.

Trends in Motor Vehicle Registrations

In 1965, Oregon counties in the study area constituted 38 per cent of total statewide motor vehicle registration. In Washington, the study area counties accounted for 13 per cent of the state-wide total.

As shown in Table 4, the 12-county study area realized an average increase in motor vehicle registrations of 2.9 per cent per year between 1955 to 1960. During this same period, Oregon and Washington recorded growths of 2.8 and 3.4 per cent, respectively. The annual average increase nationwide was 3.2 per cent.

Motor vehicle registrations increased at an even faster rate during the next five years. The study area recorded an annual average increase of 4.3 per cent which surpassed the growth rate realized statewide in Oregon and Washington and for the nation. As was true of population, retail sales and average effective buying income, Washington County recorded the highest growth in motor vehicle registrations between 1960 and 1965-7.8 per cent per year.

Table 4

MOTOR VEHICLE REGISTRATION TRENDS

<u>AREA</u>	<u>1955</u>	<u>AVERAGE ANNUAL PER CENT CHANGE</u>	<u>1960</u>	<u>AVERAGE ANNUAL PER CENT CHANGE</u>	<u>1965</u>
<u>Counties:</u>					
Oregon -					
Clatsop	13,668	0.6	14,060	3.1	16,367
Columbia	8,844	6.0	11,834	5.4	15,416
Multnomah	234,707	2.7	268,466	3.6	319,773
Tillamook	9,950	0.8	10,371	1.8	11,344
Washington	35,364	5.2	45,526	7.8	66,299
Washington -					
Clark	45,434	2.3	53,820	4.3	66,596
Cowlitz	27,665	2.5	31,258	6.1	42,024
Gray's Harbor	25,840	2.4	29,160	3.9	35,319
Lewis	22,874	2.2	25,490	4.3	31,421
Pacific	8,119	0.4	8,268	3.9	10,018
Thurston	19,794	4.0	24,135	5.2	31,166
Wahkiakum	<u>1,728</u>	<u>1.5</u>	<u>1,862</u>	<u>3.8</u>	<u>2,245</u>
12-County Study Area	453,987	2.9	524,250	4.3	647,988
<u>States:</u>					
Oregon	802,444	2.8	919,153	4.0	1,119,345
Washington	1,163,544	3.4	1,376,742	3.7	1,658,623
United States ⁽¹⁾	62,760,395	3.2	73,589,518	4.1	89,937,771

(1) Does not include Alaska and Hawaii.

SOURCE: Motor Vehicle Department, State of Oregon;
 Motor Vehicle Department, State of Washington;
Highway Statistics, U.S. Bureau of Public Roads.

Motor Fuel Consumption Trends

Motor fuel consumption in Oregon and Washington increased an average of 2.9 and 3.7 per cent annually between 1955 and 1960. As given in Table 5, this compared with an average annual growth of 3.6 per cent nationwide.

During the next five years motor fuel consumption in Oregon increased an average of 4.2 per cent per year to 908,958,000 gallons in 1965. The average annual growth in Washington was 2.7 per cent; the average increase was 3.4 per cent per year nationwide.

Table 5

MOTOR FUEL CONSUMPTION TRENDS

AREA	1955	AVERAGE ANNUAL PER CENT CHANGE	1960	AVERAGE ANNUAL PER CENT CHANGE	1965
		(thousands of gallons)			
Oregon	640,519	2.9	739,842	4.2	908,958
Washington	872,583	3.7	1,046,683	2.7	1,194,773
United States ⁽¹⁾	53,116,274	3.6	63,386,544	3.4	74,846,714

(1) Does not include Alaska and Hawaii.

SOURCE: Highway Statistics, Bureau of Public Roads, U.S. Department of Commerce.

Table 6
EMPLOYMENT AND PAYROLL GROWTH TRENDS
Clatsop County, Oregon

<u>YEAR</u>	<u>FIRST</u> (thousands)	<u>SECOND</u> (thousands)	<u>THIRD</u> (thousands)	<u>FOURTH</u> (thousands)	<u>TOTAL</u> <u>YEAR</u>	<u>PER CENT</u> <u>CHANGE</u> Over Previous Year
1960						
Employment	16,373	17,553	18,513	15,941	68,380	---
Payroll	\$ 6,068	\$ 6,566	\$ 7,167	\$ 5,923	\$25,724	---
1961						
Employment	14,947	17,098	18,254	16,015	66,314	-3.1
Payroll	\$ 5,331	6,448	7,348	6,173	25,300	-1.7
1962						
Employment	15,391	16,473	17,504	15,371	64,739	-2.4
Payroll	\$ 5,920	\$ 6,438	\$ 7,118	\$ 6,071	\$ 25,547	1.0
1963						
Employment	16,304	17,286	19,024	17,308	69,922	8.0
Payroll	\$ 6,311	\$ 7,070	\$ 8,073	\$ 7,338	\$28,792	12.7
1964						
Employment	16,157	17,449	19,486	17,176	70,268	0.5
Payroll	\$ 6,666	\$ 7,257	8,386	\$ 7,269	\$29,578	2.7
1965						
Employment	18,195	20,642	23,294	20,436	82,567	17.5
Payroll	\$ 7,808	\$ 9,200	\$11,161	\$ 9,399	\$37,568	27.0
Average Annual Change:						
1960 - 1965						
Employment						3.8
Payroll						7.9

SOURCE: Oregon Department of Employment Law

Employment and Payroll Growth Trends-Clatsop County, Oregon

Despite decreases in annual employment between 1960 and 1962, employment in Clatsop County increased an average of 3.8 per cent between 1960 and 1965. The most significant increase occurred between 1964 and 1965-17.5 per cent to a total covered employment in 1965 of 82,567 persons. As shown in Table 6, an excellent growth of 8.0 per cent was recorded between 1962 and 1963. The third annual quarter, July through September, was the peak employment period each

year between 1960 and 1965. This reflects summer employment resulting from tourist activity in the county particularly in resort areas along the Pacific Coast.

Between 1960 and 1965, reported payroll volume for Clatsop County increased from \$25,724,000 to \$37,568,000--an average annual increase of 7.9 per cent per year. The largest annual increase occurred between 1964 and 1965--an excellent growth of 27 per cent.

Future Growth

Continued development of the resources in southwest Washington is expected to have a great influence upon the Port of Astoria. Year round accessibility to docking facilities and log dumps (cold deck storage) should prove to be more attractive as a shipping point than the alternative port at Raymond, Washington. The capacity of water shipping at Raymond is limited due to adverse winter conditions and fewer facilities for docking and loading. The Port of Astoria is also extensively used for trans-oceanic shipping.

Lumber is one of the most important industries in the bridge study area. Log and chip shipments from tree farms in Pacific and Wahkiakum Counties in Washington are shipped to pulp and paper mills at St. Helens and other locations in Clatsop and Columbia Counties in Oregon. Alternatives to trucking of logs and chips are log rafts and chip barges which in many instance incur greater unit cost than trucking across the bridge.

The bridge is also used by the fishing industry, for trucking of its products, rather than boat delivery, from

Washington ports to cannaries in Astoria. The rail connections at Astoria, convenient to the packing plant make the city an important distribution center for fishing products.

The Pacific Coast Beach areas in Northwest Oregon are among the finest in the nation and are attracting increasing numbers of visitors each year. The tourist industry is one of the mainstays of the economy of Northwest Oregon, attracting many people from the less attractive beaches to the north in Washington. Trends in employment in Clatsop County during the period July through September indicate the growing attractiveness of summer recreation in the resort areas along the coast. An excellent increase in such employment occurred between 1964 and 1965; this trend is expected to continue as leisure time increased and salary and living conditions rise. Outdoor recreation is becoming one of the biggest "Businesses" in the nation and the northwest section of Oregon has the natural attributes to attract visitation from populated areas many miles removed.

It is estimated that population, retail sales and effective buying income in the bridge study areas will continue to grow in the foreseeable future at rates equal to or in excess of those realized over the last decade. Travel, as measured by motor vehicle registrations and motor fuel consumption, will increase at rates considerably above those recorded historically. The areas in Oregon and Washington, within the general influence of the Astoria Bridge, are presently closely linked in terms of culture, industrial and commercial interests and recreational supply and demand. This integration of the region was given a tremendous impetus upon construction of the Astoria Bridge. The full potential of this facility, as an instrument in improving trans-river

interaction, will become increasingly significant over the next several years. As travel within the region increases, use of the Astoria Bridge will rise in parallel fashion.

Chapter 3

TRAFFIC STUDIES

Detailed studies were made of trends and characteristics of trans-river traffic in the travel corridor of the Astoria Bridge. These included origin and destination survey on the Astoria and Longview Bridges, route reconnaissance investigations on approach highways to both facilities and analyses of all available traffic trend and count data.

Present Highway System

The Astoria Bridge is part of U. S. Route 101. This north-south coastal highway traverses the west coast from Mexico to Canada. The alternative north-south route in the area is Interstate Route 5 which links the larger urban areas of Oregon, Washington and California following a path considerably inland of U. S. Route 101.

The major east-west routes in the Astoria Bridge area are U. S. Route 26 and 30 in Oregon and U. S. Route 830 in Washington. The two latter highways generally parallel the Columbia River between the Astoria and Longview Bridges, serving the numerous lumber-oriented communities along the river.

The relative importance of these highways is shown in Figure 2. Traffic volumes are drawn to scale; the width of the flow bands are proportional to the number of vehicles using the routes on an average day in 1965.

U. S. Route 30, East of Astoria, carried approximately 3,900 vehicles per day in 1965, decreasing to 1,400 vehicles daily near Ranier. An average daily traffic volume of 6,000 vehicles was recorded on U. S. Route 101, at Astoria, decreasing to 4,500 per day near Seaside. Traffic volumes ranging from less than 2,000 to 5,000 vehicles per day were found along U. S. Route 830 between U. S. Route 101 and Longview.

Annual Traffic Trends

Annual traffic trends at three locations on Oregon Highways in the area of the Astoria Bridge indicate good growths have occurred over the last five to ten years. As shown in Table 7, traffic increased an average of 6.1 per cent on U. S. Route 30, west of Ranier. The increase between 1960 and 1965 was 9.1 per cent per year. During the same five year period, volumes on U. S. Route 101, north of Gearhart increased an average of 4.6 per cent; the comparable growths on Oregon Route 202, southeast of Olney was 10.6 per cent. At each count location, excellent growths ranging from 12.9 to 37.0 per cent occurred between 1964 and 1965.

Traffic on the Vancouver-Portland Bridge increased an average of 4.1 per cent between 1955 and 1960, compared with growths of 9.4 and 1.0 per cent on the Longview Bridge and Megler Ferry, respectively. During the last five years, Table 8, indicates that traffic on these facilities increased at an even faster rate. A growth of 5.7 per cent per year occurred on the Vancouver-Portland Bridge, traffic on the Longview Bridge increased 11.4 per cent and use of the Megler Ferry- 4.8 per cent.

Table 7

ANNUAL TRAFFIC TRENDS
Selected Highway Locations

YEAR	(1) U.S. ROUTE 101	PER CENT CHANGE	(2) OREGON ROUTE 202	PER CENT CHANGE	(3) U.S. ROUTE 30	PER CENT CHANGE
	(Average Daily Traffic)					
1955	--	--	--	--	1,481	--
1956	--	--	--	--	1,545	4.3
1957	3,018	--	--	--	1,613	4.4
1958	3,200	6.0	144	--	1,704	5.6
1959	3,229	0.9	138	-4.3	1,663	-2.5
1960	3,415	5.8	142	2.9	1,730	4.0
1961	3,387	-0.8	157	10.6	1,857	7.3
1962	3,601	6.3	158	0.6	1,907	--
1963	3,611	0.3	178	12.7	1,856	-2.7
1964	3,788	4.9	207	16.3	1,957	5.4
1965	4,276	12.9	235	13.5	2,682	37.0

AVERAGE ANNUAL PER CENT CHANGE:

1955 - 1965						6.1
1960 - 1965		4.6		10.6		9.1

- (1) Oregon Permanent
Recorder 4A, 2 miles north of Gearhart.
- (2) Oregon Permanent
Recorder 4J, 5 miles southeast of Olney.
- (3) Oregon Permanent
Recorder 5F, 3.5 miles west of Ranier.

SOURCE: Oregon State Highway Department.

Table 8

ANNUAL TRAFFIC TRENDS
Vancouver-Portland Interstate Bridge
Longview Bridge-Megler Ferry

YEAR	(1)			(2)		
	VANCOUVER- PORTLAND BRIDGE	PER CENT CHANGE	LONGVIEW BRIDGE	PER CENT CHANGE	ASTORIA- MEGLER FERRY	PER CENT CHANGE
	(Average Daily Traffic)					
1955	27,810		1,379		384	
		23.5		8.6		-4.3
1956	34,335		1,498		368	
		-1.7		3.9		-7.6
1957	33,754		1,557		342	
		4.4		2.8		-
1958	35,235		1,600		342	
		9.3		5.9		-1.2
1959	38,520		1,694		338	
	(3)	-21.7		6.4		-1.2
1960	31,663		1,802		334	
		7.1		10.9		3.0
1961	33,914		1,999		344	
		7.9		9.0		23.8
1962	36,580		2,179		426	
		-1.4		4.4		-16.7
1963	36,081		2,275		365	
		6.4		8.9		6.3
1964	38,394		2,478		388	
		8.8	(4)	37.0		9.0
1965	41,771		3,395		423	

AVERAGE ANNUAL PER CENT CHANGE:

1955 - 1965	4.1	9.4	1.0
1960 - 1965	5.7	11.4	4.8

- (1) Washington Toll Bridge Authority.
 (2) Oregon State Highway Department.
 (3) Toll Traffic Began January 10, 1960.
 (4) Toll Removed October 19, 1965.

Monthly Traffic Variations

The summer month of July and August account for peak traffic volumes on U. S. Route 101, Oregon Route 202 and U. S. Route 30. As shown in Table 9, traffic on U. S. Route 101 in July and August was 53 and 57 per cent above average respectively. Somewhat lower peaks occurred at the other two locations. The low traffic month on each highway was January.

The seasonal nature of traffic in the Astoria Bridge corridor is also reflected by monthly trends on the Vancouver-Portland Bridge, the Longview Bridge and the Astoria-Megler Ferry. As shown in Table 10, July and August were the peak traffic months with use of the ferry increasing 111 and 156 per cent above the average month, far above the more moderate variations shown on the two bridges. An indication of the extreme range in use of the ferry is the number of vehicles carried--an average of 141 per day in January compared to 1,082 in August.

Since opening of the Astoria Bridge on July 29, 1966, monthly trends have closely approximated these experiences on the Astoria-Megler Ferry which it supplanted as indicated in Table 11. Average daily traffic in August of 2,470 vehicles occurred. Thereafter, through January monthly traffic declined significantly each month, generally following seasonal trends. For example, traffic during September was 68 per cent of the August volume, January usage was 543 vehicles per day or 22 per cent of the August level

Table 9
MONTHLY TRAFFIC VARIATIONS
Selected Highway Locations
1965 Average Daily Traffic

<u>MONTH</u>	(1)		(2)		(3)	
	<u>U. S. ROUTE</u> <u>101</u>	<u>INDEX</u>	<u>OREGON ROUTE</u> <u>202</u>	<u>INDEX</u>	<u>U.S. ROUTE</u> <u>30</u>	<u>INDEX</u>
Jan.	2,746	0.64	131	0.56	1,704	0.64
Feb.	3,178	0.74	194	0.83	1,910	0.71
Mar.	3,980	0.93	216	0.92	2,447	0.91
Apr.	3,892	0.91	177	0.75	2,630	0.98
May	4,448	1.04	233	0.99	2,730	1.02
Jun.	5,057	1.18	276	1.18	3,016	1.12
Jul.	6,528	1.53	291	1.24	3,440	1.28
Aug.	6,696	1.57	251	1.07	3,507	1.31
Sep.	4,567	1.07	285	1.21	3,052	1.14
Oct.	3,400	0.79	326	1.39	2,790	1.04
Nov.	3,590	0.84	258	1.10	2,563	0.96
Dec.	<u>3,236</u>	<u>0.76</u>	<u>178</u>	<u>0.76</u>	<u>2,395</u>	<u>0.89</u>
AVERAGE MONTH	4,277	100	235	100	2,682	100

-
- (1) Oregon Permanent
Recorder 4A, 2 miles north of Gearhart.
(2) Oregon Permanent
Recorder 4J, 5 miles southeast of Olney.
(3) Oregon Permanent
Recorder 5F, 3.5 miles west of Ranier.
SOURCE: Oregon State Highway Department.

Table 10

MONTHLY TRAFFIC VARIATIONS
VANCOUVER-PORTLAND BRIDGE,
LONGVIEW BRIDGE AND MEGLER FERRY

1965 Average Daily Traffic

<u>MONTH</u>	<u>VANCOUVER- PORTLAND BRIDGE</u>	<u>INDEX</u>	<u>LONGVIEW⁽¹⁾ BRIDGE</u>	<u>INDEX</u>	<u>ASTORIA- MEGLER FERRY</u>	<u>INDEX</u>
Jan.	34,681	0.83	1,885	0.76	141	0.33
Feb.	37,514	0.90	2,197	0.89	186	0.44
Mar.	39,715	0.95	2,259	0.91	271	0.64
Apr.	41,162	0.98	2,270	0.92	283	0.67
May	41,296	0.99	2,506	1.01	370	0.87
June	44,548	1.07	2,825	1.14	524	1.24
July	46,208	1.11	3,103	1.25	895	2.11
Aug.	48,285	1.16	3,135	1.27	1,082	2.56
Sep.	43,786	1.05	2,679	1.08	617	1.46
Oct.	41,417	0.99	2,414	0.98	298	0.70
Nov.	40,827	0.98	2,251	0.91	231	0.55
Dec.	41,509	0.99	2,187	0.88	181	0.43
AVERAGE MONTH	41,746	100	2,476	100	423	100

(1) Toll Removed October 19, 1965; 1964 Monthly trends

SOURCE: Oregon State Highway Department; Washington Toll Bridge Authority.

Table 11

MONTHLY TRAFFIC TRENDS
ASTORIA BRIDGEAugust, 1966-January, 1967⁽¹⁾

<u>MONTH</u>	<u>AVERAGE DAILY VEHICLES</u>	<u>PER CENT OF AUGUST TRAFFIC</u>
Aug.	2,470	100
Sep.	1,675	68
Oct.	884	36
Nov.	676	27
Dec.	577	23
Jan.	543	22

(1) Bridge opened to motorists on July 29, 1966.

SOURCE: Oregon State Highway Department.

Origin and Destination Studies

Present travel patterns of motorists using the Astoria and Longview Bridges were determined through origin and destination roadside interview surveys conducted at both facilities over a period of several days by the Oregon State Highway Department. Motorists were asked their trip origin, destination and purpose. In addition, trip frequency and vehicle type were also recorded. As shown in Table 12, a total of 7,644 interviews was obtained, 2,596 on the Astoria Bridge and 5,048 on the Longview Bridge.

Table 12

LOCATION AND OPERATION OF SURVEY STATIONS
1966

<u>LOCATION</u>	<u>DATE</u>	<u>DAY</u>	<u>HOURS OF INTERVIEW</u>	<u>NUMBER OF INTERVIEWS</u>
Astoria Bridge	9-10	Sat.	6 AM-9 PM	380
	9-11	Sun.	6 AM-9 PM	933
	9-12	Mon.	6 AM-9 PM	656
	9-13	Tue.	6 AM-9 PM	627
Subtotal				2,596
Longview Bridge	10-15	Sat.	7 AM-5 PM	1,361
	10-16	Sun.	8 AM-5 PM	1,162
	10-17	Mon.	7 AM-Mid.	1,383
	10-18	Tue.	Mid.-7 PM	1,142
TOTAL INTERVIEW				7,644

Vehicle Classification Counts

Vehicle classification counts were made for a continuous 24-hour period, including the hours of interview, for each interview day at both bridges. As shown in Table 13, passenger cars and pick-up and panel trucks made up the majority of vehicles using the bridges. A significant increase in vehicular traffic occurred on the Astoria Bridge on weekend days, particularly Sunday. The number of passenger cars and two-axle vehicles pulling trailers increased dramatically, indicating the recreational nature of bridge use. Very few heavy and combination trucks were counted during the survey period.

Table 13

VEHICLE CLASSIFICATION COUNTS

Interview Survey Period

<u>LOCATION</u>	<u>DAY</u>	<u>PASSENGER CAR & PICKUP & PANEL TRUCK</u>	<u>P.C. AND P.P. WITH TRAILER</u>	<u>LIGHT TRUCK</u>	<u>HEAVY TRUCK</u>	<u>COMBINA- TION TRUCK</u>	<u>BUSES</u>	<u>MOTOR- CYCLES</u>	<u>TOTAL VEHICLES</u>
Astoria Bridge	Sat.	1,926	144	22	--	1	--	8	2,103
	Sun.	2,281	148	6	1	--	--	--	2,436
	Mon.	1,214	60	27	4	8	--	3	1,316
	Tue.	1,190	60	25	7	12	--	4	1,298
Longview Bridge	Sat.	6,461	29	57	14	41	8	11	6,621
	Sun.	7,574	30	27	16	15	3	11	7,676
	Mon.	5,644	17	159	179	230	5	14	6,248
	Tue.	5,409	12	151	115	245	2	8	5,942

Sunday was also a peak traffic day on the Longview Bridge with much heavier passenger car volumes than on weekdays. However, heavy and combination truck traffic peaked during weekdays--a total of 409 heavy and combination trucks were counted on Monday, representing 6.6 per cent of total traffic. By comparison, only 19 heavy and combination vehicles were measured on the Astoria Bridge on the peak day of truck usage, Tuesday, which represented 1.5 per cent of total traffic.

Estimated 1966 Annual Average Daily Traffic

Concurrent with the origin and destination surveys and vehicle classification count program, a continuous seven day, hourly traffic count was obtained at both bridges either from toll transaction records or from automatic traffic recorders. Using this information, together with monthly and daily toll transactions to date on the Astoria Bridge, it was estimated that approximately 1,230 vehicles per day would have used the bridge at 1966 levels. The estimated 1966 average traffic for the Longview Bridge was 6,400 vehicles.

Present Travel Patterns

The origin and destination data obtained from the road-side interview surveys were coded to geographic traffic zones. A portion of the zone pattern used is depicted in Figure 3. The coded data, together with the day and hour of interview and vehicle class, were then transposed to statistical tabulating cards. Using the distribution developed from the vehicle classification counts, the interview data were then factored to the 1966 annual average traffic estimated for each bridge. In this manner, the interviews for each class of vehicle were properly weighed and adjusted for hourly variations in interview sample size.

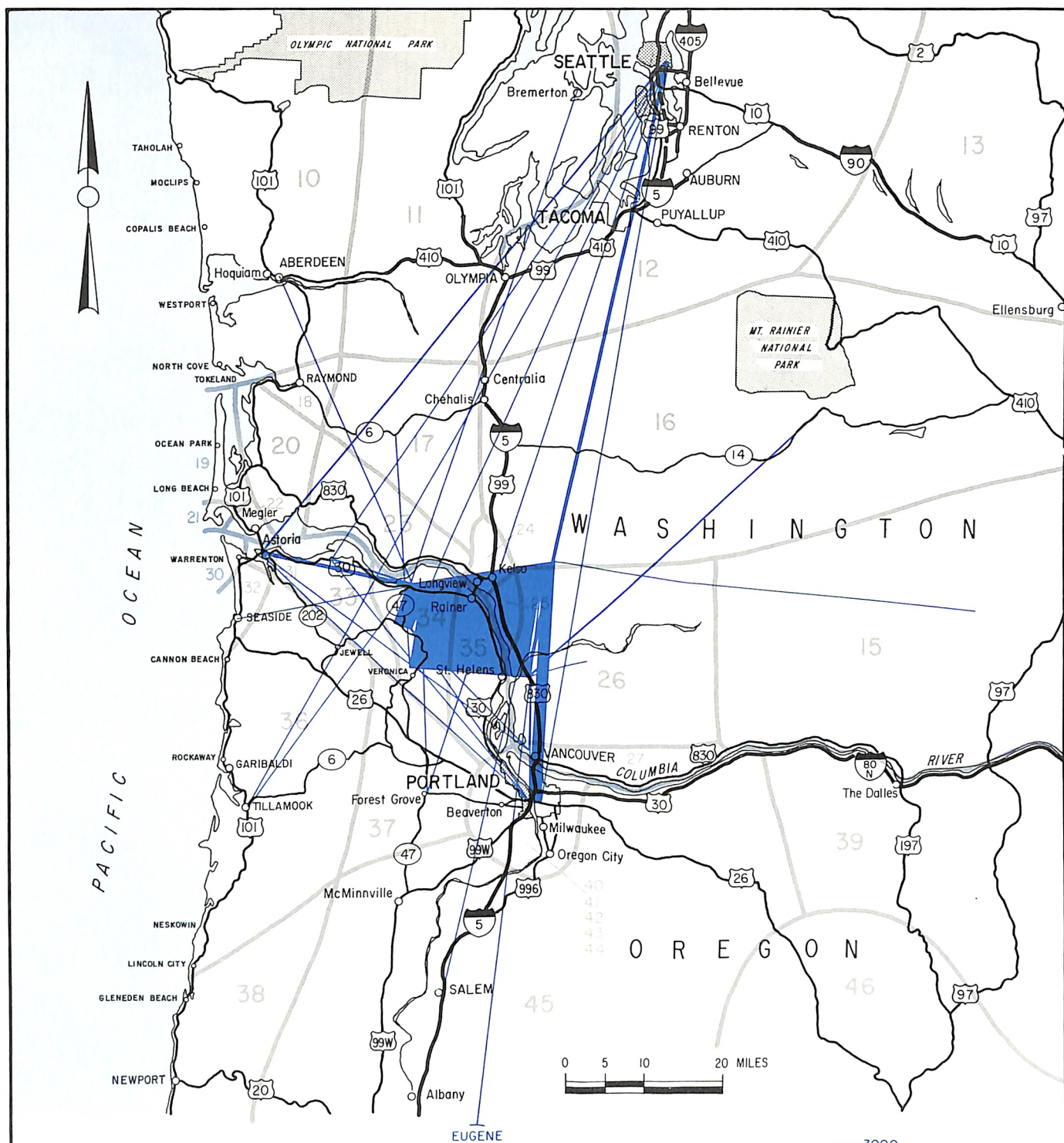
Travel desire of trips using the Astoria Bridge are shown in Figure 3. Only movements in excess of 15 vehicles per day are illustrated; the width of the desired lines are proportional to the number of vehicles making each movement. The largest travel desire was that between the Long Beach area and Astoria, 87 trips per day. Seventy-two trips per day were recorded between the area immediately south of Long Beach and Portland. The movement between this same area in Washington and Astoria was 56 trips per day. Trips between Portland and the Long Beach area amounted to 54 vehicles per day. The next largest movement using the bridge was between the Olympia-Tacoma area and Seaside -- 42 trips per day. Only 30 vehicles per day were found moving between Astoria and Megler, indicating an unusually low volume of local traffic use of the bridge.

By comparison, a very heavy local travel movement was found on the Longview Bridge. As depicted in Figure 4, over 4,000 vehicles per day move between the Longview-Kelso area and Ranier-St. Helen's. Four of the five highest volume trip movements on the Longview Bridge had the Longview-Kelso area as either an origin or destination.

The movement between Portland and Longview-Kelso was 352 vehicles per day. Approximately 130 motorists daily used the Longview Bridge on a trip between Longview and Astoria. Another 130 trips daily traveled between the Ranier-St. Helen area and Olympia-Tacoma.

Trip Purpose Distribution

Most of the motorists interviewed on the Astoria Bridge were making tourist or recreational-oriented trips. As



TRAVEL DESIRES
LONGVIEW BRIDGE
 1966

3000 1966 A.A.D.T.
 2000
 1000
 500
VEHICLE SCALE
 TRIPS LESS THAN 15 NOT SHOWN

presented in Table 14, 37.8 per cent said they were on a vacation trip, 21.0 per cent were sightseeing and 19.9 per cent had other trip purposes relating to social-recreational activity. Only 2.5 per cent indicated they were making a shopping trip, 11.8 per cent had personal business as a trip purpose and 6.8 per cent were making work trips.

A completely different trip purpose distribution was found on the Longview Bridge where the primary purpose was work - 30.9 per cent, followed by shopping - 25.4 per cent and personal business - 22.3 per cent. Only 2.8 per cent of the motorists indicated they were on vacation trips. Sightseeing accounted for 4.2 per cent of all trip purposes and other social-recreational activity - 14.3 per cent.

Trip Frequency Distribution

As would be expected, trip frequency distribution on the bridges closely followed the pattern found in travel desires and trip purpose. The great majority of the motorists interviewed on the Astoria Bridge indicated they used the facility less than once a week -- 86.4 per cent of all traffic. As shown in Table 15, another 9.6 per cent said they crossed the bridge 1-4 times per week, 1.3 per cent indicated 5-9 trips per week and only 2.7 per cent used the facility 10 or more times weekly. The last category and possibly some portion of the 5-9 trip per week group would normally be considered as commuters. It should be recognized, however, that at the time of the survey, bridge travel characteristics had not yet had the opportunity to become stabilized since the facility had only been opened since July 29, 1966.

Table 14

TRIP PURPOSE DISTRIBUTION
Astoria and Longview Bridges

<u>TRIP PURPOSE</u>	<u>ASTORIA BRIDGE</u> (per cent of total)	<u>LONGVIEW BRIDGE</u> (per cent of total)
Work	6.8	30.9
Personal Business	11.8	22.3
Shopping	2.5	25.4
Sightseeing	21.0	4.2
Vacation	37.8	2.8
Other Social- Recreational	19.9	14.3
Miscellaneous	<u>0.2</u>	<u>0.1</u>
TOTAL	100.0	100.0

A considerably different trip frequency distribution was found on the Longview Bridge. This facility serves a very substantial local traffic movement with many motorists on work trips. This correlates well with the relatively high percentage of commuter trips found; 29.9 per cent of the motorists interviewed indicated they made 10 or more trips per week. Another 11.3 per cent made 5-9 trips weekly, 34.2 per cent indicated 1 to 4 trips per week and the remaining 24.6 per cent used the bridge less than once a week.

Typical Time-Distance Relationships

Based upon time and distance studies made on the major highways serving the Astoria-Longview Bridges corridor, trip distances and times via the two crossings were computed for

Table 15

TRIP FREQUENCY DISTRIBUTION
Astoria and Longview Bridges

	<u>ASTORIA BRIDGE</u> (per cent of total)	<u>LONGVIEW BRIDGE</u>
10 or more trips per week	2.7	29.9
5-9 trips per week	1.3	11.3
1-4 trips per week	9.6	34.2
Less than one trip per week	86.4	24.6
TOTAL	<u>100.0</u>	<u>100.0</u>

numerous trans-river movements. A trip from Astoria to Olympia, via the Astoria Bridge, would be nine miles and 24 minutes longer than a routing using the Longview Bridge. As given in Table 16, a trip from Astoria to Aberdeen would result in savings of 75 miles and 75 minutes through use of the Astoria Bridge rather than the Longview facility.

Trips between Aberdeen and Ranier or Portland would be five miles and six minutes longer via the Astoria Bridge. By contrast, a trip from Aberdeen to Tillamook, using the same bridge would result in a savings of 86 miles and 128 minutes.

The most attractive use of the Astoria Bridge would be for a trip between Astoria and Megler which would provide a savings of 125 miles and 162 minutes over the best alternate river crossing at Longview.

Table 16
TYPICAL TIME-DISTANCE RELATIONSHIPS

<u>FROM</u>	<u>TO</u>	<u>VIA</u>	<u>DISTANCE MILES</u>	<u>TIME (MIN.)</u>	<u>MILES PER HOUR</u>	<u>SAVINGS</u>	
						<u>VIA ASTORIA MILES</u>	<u>BRIDGE MIN.</u>
Astoria	Olympia	Astoria Bridge	129	162	47	--	--
		Longview Bridge	120	138	52	-9	-24
	Aberdeen	Astoria Bridge	81	109	45	--	--
		Longview Bridge	156	184	51	75	75
Aberdeen	Ranier	Astoria Bridge	135	179	45	--	--
		Longview Bridge	130	173	45	-5	-6
	Portland	Astoria Bridge	185	244	46	--	--
		Longview Bridge	180	238	46	-5	-6
	Tillamook	Astoria Bridge	147	197	45	--	--
		Longview Bridge	233	325	44	86	128
Portland	Megler	Astoria Bridge	120	157	46	--	--
		Longview Bridge	115	151	46	-5	-6
Astoria	Megler	Astoria Bridge	5	9	33	--	--
		Longview Bridge	130	171	46	125	162

Chapter 4

ESTIMATED TRAFFIC AND REVENUES

Annual traffic estimates for the Astoria Bridge were developed based upon monthly experience since opening of the bridge on July 29, 1966, the travel pattern information determined through the origin and destination survey, and anticipated travel and economic growth in the area served by the bridge. In addition, a measure of induced or generated and development growth was estimated for the initial years of operation.

Annual revenue estimates were determined after analyses of numerous toll rates to arrive at the rate schedule which would result in optimum revenues while still maintaining a high level of service. The recommended toll schedule was then correlated with the annual traffic estimates for the facility.

Basic Assumptions

Annual traffic and revenue estimates for the Astoria Bridge are based upon the following assumptions:

1. The recommended toll schedule will be implemented on August 1, 1967.
2. No competing bridges, either toll or free, will be constructed to the west of the Astoria Bridge or as far east as the Longview Bridge.

3. The bridge will continue to be well maintained and efficiently operated.
4. The present general trend in economic activity will continue and no national emergency will arise which would abnormally restrict the use of motor vehicles.

Any departure from these basic assumptions could materially affect estimated traffic and revenues for the bridge.

Recommended Toll Schedule

Several toll rates were investigated to determine the rate structure which would serve to maximize revenues while still providing a high level of traffic service on the bridge. Under the present toll schedule, shown in Table 17, the toll for a light vehicle or automobile is \$1.50. If the vehicle is hauling a one-axle trailer, the combined toll increases to \$2.00. If the trailer is a two-axle vehicle, the combined toll is \$2.25. A two-axle truck or bus pays a toll of \$3.00; if the vehicle has three axles, the toll increases to \$3.75. A four-axle truck pays a toll of \$4.50; vehicles with more than four axles pay the \$4.50 rate plus \$0.75 for each additional axle.

Prior to opening of the Astoria Bridge, service between Astoria and Megler was provided by the Astoria-Megler Ferry. The automobile toll on the ferry was \$1.25 with an additional toll of \$0.25 for each adult vehicle occupant, other than the driver. The average automobile toll, including all vehicle occupants, was \$1.75 in 1965. The Longview and Vancouver-Portland Bridges were recently made toll-free; when operated

Table 17
PRESENT TOLL SCHEDULE
Astoria Bridge

<u>DESCRIPTION</u>	<u>TOLL</u>
Light Vehicle, Car	\$1.50
With 1-Axle Trailer	2.00
With 2-Axle Trailer	2.25
Truck or Bus, 2-Axle	3.00
With 3-Axle	3.75
Truck Combination, 4-Axle	4.50
With 5-Axle	5.25
With 6-Axle	6.00
With 7-Axle	6.75
With 8-Axle	7.50
Each Additional Axle	0.75
Motorcycle or Bicycle	1.00

as toll facilities, the automobile toll on the Longview Bridge was \$0.50 and on the Vancouver-Portland Bridge-\$0.20.

The toll rate analyses for the Astoria Bridge weighed relative trip costs via the Astoria Bridge versus the Longview Bridge against existing movements measured on the two bridges and empirical diversion curves developed from studies of similar facilities. Total trip costs included tolls on the Astoria Bridge. As various toll rates were tested, trip costs and traffic diversions changed and different levels of total aggregate revenues were determined.

Table 18

RECOMMENDED TOLL SCHEDULE
Astoria Bridge

<u>VEHICLE TOLL CLASS</u>	<u>DESCRIPTION</u>	<u>TOLL</u>
	Two-Axle Vehicle	
1	Cash	\$2.00
2	Ticket (1)	1.00
3	Three-Axle Vehicle or Vehicle Combination	3.00
4	Four-Axle Vehicle or Vehicle Combination	4.00
5	Five-Axle Vehicle or Vehicle Combination	5.00
	Each Additional Axle	1.00

(1) Ten-trip ticket book good for seven days; book must be shown when surrendering ticket.

The recommended toll schedule for the Astoria Bridge is indicated in Table 18. The toll for two-axle vehicles is \$2.00; larger vehicles or vehicle-combinations would pay a per-axle toll based upon \$1.00 per axle. For example, a four-axle vehicle would pay \$4.00 for one-way use of the bridge.

While little commuter use of the Astoria Bridge was found in the origin and destination survey, a commutation rate for two-axle vehicles is recommended. The lower toll would serve to encourage local usage of the facility and it is estimated that the additional traffic generated would exceed the loss

in revenues resulting from a 50 per cent reduction in the cash toll for frequent users. The commutation rate could be implemented through a ten-trip ticket book good for seven days. Proper control of ticket use would require that the book be shown when surrendering a trip ticket.

The advisability of volume discounts for large volume truck users of the Astoria Bridge was also investigated. Due to the very low level of present truck usage, it does not appear at this time such a discount would induce enough additional truck travel to offset the revenue loss from lower net tolls and expense of establishing and administering a discount program.

The ratio between the recommended automobile and heavy truck tolls is substantially more favorable than previously in use on the Astoria-Megler Ferry and on other toll bridges in the area. Interviews with various trucking concerns and large manufacturers in the area of the Astoria Bridge were inconclusive as to the impact on usage a discount on tolls would bring.

We feel the recommended toll schedule will serve to optimize revenues on the Astoria Bridge. We recommend that continuing studies be made of truck usage of the bridges as time goes on, so that a volume discount schedule can be implemented when volumes warrant this action.

Estimated Growth in Bridge Usage

Estimated annual traffic growth for the Astoria Bridge was based on historical use of the Megler-Ferry, Longview

Bridge and Vancouver-Portland Bridge, annual growth at the permanent traffic recorders maintained by the Highway Department in the area of the facility and on anticipated economic development in the bridge study area. During the period 1960-1965, traffic on the Megler-Ferry increased an average of 4.8 per cent per year. Use of the Longview Bridge recorded an increase of 11.4 per cent annually during this same period; however, most of the growth occurred between 1964 and 1965 when the bridge was made toll free. The Vancouver-Portland Bridge experienced an average annual traffic increase of 5.7 per cent between 1960 and 1965. The three highway traffic recorders located in the travel corridor of the Astoria Bridge recorded average annual growths between 1960 and 1965 ranging from 4.6 to 10.6 per cent per year. As already discussed, more nominal growths occurred in population, retail sales, effective buying income per family and motor vehicle registrations in the study area during the same period.

As shown in Table 19, it is estimated that use of the Astoria Bridge will increase an average of 4.0 per cent per year between 1966 and 1973, decreasing to a growth of 3.5 per cent per year during the next four years and to 3.0 per cent annually through 1981. In addition, a second year inducement of 6.0 per cent is estimated for automobile and light truck bridge traffic in 1967. An inducement of 10.0 per cent is estimated for heavy truck usage in 1967, decreasing to 5.0 per cent during the next year of operation.

Estimated 1968 Traffic and Revenues

In 1968, the first full calendar year the new toll schedule will have been in effect, an estimated 1,234 vehicles per day

Table 19
ESTIMATED ANNUAL PER CENT TRAFFIC GROWTH
Astoria Bridge

<u>YEAR</u> ⁽¹⁾	<u>NORMAL CORRIDOR GROWTH</u>	<u>GENERATED AND DEVELOPMENT GROWTH</u>	
		<u>Passenger Cars And Light Trucks</u>	<u>Heavy Trucks</u>
1966	4.0	6.0	10.0
1967	4.0		5.0
1968	4.0		
1969	4.0		
1970	4.0		
1971	4.0		
1972	4.0		
1973	3.5		
1974	3.5		
1975	3.5		
1976	3.5		
1977	3.0		
1978	3.0		
1979	3.0		
1980	3.0		
1981			

(1) Twelve-month period beginning August 1.

will use the Astoria Bridge. As shown in Table 20, it is estimated that 1,043 motorists will pay the two axle vehicle cash toll; 103, the two-axle-ticket toll; and 69 vehicles-- the three-axle vehicle or vehicle combination toll. It is estimated that 15, four-axle vehicles or vehicle combinations will use the bridge on an average day in 1968; an additional four, five-axle vehicles will also use the toll facility.

Toll revenues of \$903,800 are estimated in 1968. The majority of these revenues would come from the two-axle vehicle-cash toll category--\$761,400. The three-axle vehicle or vehicle combination toll class will account for \$75,600, two-axle vehicles paying the ticket toll--\$37,600, four-axle vehicles--\$21,900 and five-axle vehicles--\$7,300.

Estimated Annual Traffic and Revenues

Assuming the recommended toll schedule is implemented on August 1, 1967, toll revenues for the Astoria Bridge in 1967 are estimated at \$800,000. Revenues in 1981 are estimated at \$1,431,000. As shown in Table 21, average annual revenues over the first five years of the projection period are estimated at \$929,000. The average over the first ten years, 1967-1976, are estimated at \$1,036,000; the 30-year average is \$1,286,000.

During 1967, average daily traffic on the bridge is estimated at 1,220 vehicles. As shown in Table 21, use of the bridge is estimated to increase to 1,950 vehicles daily in 1981.

Table 20
ESTIMATED 1968 TRAFFIC AND REVENUES
Astoria Bridge

<u>VEHICLE TOLL CLASS</u>	<u>DESCRIPTION</u>	<u>AVERAGE DAILY TRAFFIC</u>	<u>ANNUAL TOLL REVENUES</u>
1	Two-Axle Vehicles Cash Toll	1,043	\$ 761,400
2	Two-Axle Vehicles Ticket Toll	103	37,600
3	Three-Axle Vehicles	69	75,600
4	Four-Axle Vehicles	15	21,900
5	Five-Axle Vehicles	<u>4</u>	<u>7,300</u>
	TOTAL	1,234	\$ 903,800

No increase in traffic and revenues has been estimated beyond 1981 for purposes of conservatism although a continued annual growth in traffic will likely occur. The annual traffic and revenue estimates are intended to show the trend over a period of years rather than the revenues for any particular year since local conditions may influence usage in a given year to a greater extent than might normally be projected.

Table 21
ESTIMATED ANNUAL TRAFFIC AND REVENUES (1)
Astoria Bridge

<u>YEAR</u>	<u>AVERAGE DAILY TRAFFIC</u>	<u>ANNUAL REVENUES</u>
1967	1,220	\$ 800,000
1968	1,230	904,000
1969	1,280	943,000
1970	1,330	980,000
1971	1,390	1,020,000
1972	1,440	1,061,000
1973	1,500	1,103,000
1974	1,560	1,144,000
1975	1,610	1,184,000
1976	1,670	1,226,000
1977	1,730	1,269,000
1978	1,780	1,310,000
1979	1,840	1,349,000
1980	1,890	1,390,000
1981	1,950	1,431,000
Next 15 Years Annually		\$ 1,431,000
<u>AVERAGE ANNUAL REVENUES:</u>		
First Five Years		\$ 929,000
First Ten Years		\$ 1,036,000
Thirty Years		\$ 1,286,000

(1) Assumes implementation of the recommended toll schedule on August 1, 1967.